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The comparison of laporoscopic and open procedures in ventral-incisional hernia repair

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Abstract

Aim: To compare the results of laparoscopic ventral-incisional hernia repair (LVHO) with open surgery.

Materials and Methods: Sixty patients with ventral-incisional hernia underwent hernia repair. Of these patients, 30 (Group 1) underwent LVHO and the other 30 (Group 2) underwent open surgery. The intraperitoneal mesh was used for LVHO and the abdominal on-lay mesh technique was used for open hernia repair. The groups were compared in terms of body mass index (BMI), anesthesia score values (ASA), mesh diameter, operative time, hospital stay, visual analog scale (VAS), recurrence, and complications.

Results: There was no statistically significant difference between the groups in terms of BMI and ASA (p=0.87, P=0.74). The mean operative time was 80.0 (60-150) minutes in Group 1 and 72.5 (45-160) minutes in Group 2 (p=0.07). The mean hospital stay was 2.3 days (1-9) in Group 1 and 3.5 days (1-20) in Group 2 (p=0.089). The results of VAS value at 72 hours were statistically different between the groups (p=0.000). Complications were found in 10 patients (33.3%) in Group 1 and 7 patients (23.3%) in Group 2 (p=0.567). Recurrence was detected in one case (3.3%) in Group 1 and 4 cases (13.3%) in Group 2 (p=0.35).

Discussion: LVHO is as effective and safe as open surgery with less postoperative pain.

Keywords

Ventral Hernia, Mesh, Laparoscopy, Open Surgery

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Introduction

The incidence of ventral-incisional hernia has been reported to be 2-11% [1]. Ventral-incisional hernia has become one of the most important problems of surgery due to its high incidence and high morbidity rate. Ventral-incisional hernias can be repaired by open surgery or laparoscopic methods. Although recurrence rates of 30-50% have been reported after open ventral hernia repair (AVHO), recurrence rates may decrease to 0-15% when hernia repair is performed with mesh [2]. These rates have decreased to less than 5% thanks to meshes that can be placed into the peritoneum [3]. On the other hand, although the use of mesh in open surgery has decreased the recurrence rate, complications such as wound infection, hematoma and seroma may increase due to extensive tissue dissection [4].

Laparoscopic surgery offers advantages such as minimal tissue trauma, detailed visualization of the mesh and surrounding tissue, and a more comfortable view with the magnification effect of the telescope. However, experience is also required to achieve successful results in laparoscopic operations. Laparoscopic ventral hernia repair (LVHO) was first reported by LeBlanc and Booth in 1993 [5]. In many subsequent studies, hospital stay, post-operative pain and other complication rates were reported to be lower in patients undergoing LVHO [6-8]. Recurrence rates in LVHO have been reported as 0-9% [9]. Therefore, LVHO has become a serious alternative treatment option to open surgery in the treatment of ventral-incisional hernia. However, when the studies are analyzed, it is not possible to make a definite judgment about which method is more successful.

In this study, the results of patients who underwent LVHO and AVHO for ventral-incisional hernia were compared and discussed with the relevant literature.

Material and Methods

Between April 2004 and February 2008, 60 patients who were operated on for ventral incisional hernia in the 3rd General Surgery Clinic of the Ministry of Health Okmeydanı Training and Research Hospital were included in the study. Of these patients, 30 (Group 1) underwent LVHO and the other 30 (Group 2) underwent AVHO. Patients with a hernia defect smaller than 3 cm and patients who underwent emergency surgery were not included in the study. Physical examination, all necessary preoperative tests (complete blood count, biochemistry, bleeding time and hepatitis markers, posterio-anterior chest radiography and electrocardiography) and USG were performed in all patients. Informed consent forms were obtained from all patients. Age, gender, height and weight data of the patients were recorded. Body mass index (BMI) was measured in all patients. Antibiotic prophylaxis was administered to all patients with cefazolin sodium 1 g one hour before induction and 8 hours post-operatively. Venous thrombo-embolism prophylaxis with anti-embolic stockings and low molecular weight heparin was performed in both groups. All Group 1 patients underwent preoperative mechanical bowel cleansing. In Group 2, only recurrent incisional hernia cases underwent mechanical bowel cleansing. Anesthesia score values (ASA) were recorded. Oral fluid intake was started at the 6th postoperative hour and oral food was started in patients who tolerated it. All patients received diclofenac sodium IV twice a day on postoperative days 1 and 2. The drain was removed after the color of the fluid coming from the drain was clear and the flow rate dropped below 50 ml. Analgesia was then provided with oral analgesics. Pain scoring was performed in the postoperative period. For this purpose, a visual analog score (VAS) was used. The patient was asked to choose the number that best describes his/her pain from a scale with numbers from 1 to 10. Postoperative pain values at 24, 48 and 72 hours were recorded. All patients were called for follow-up 1 week after discharge. Follow-up visits were performed at 1, 3 and 12 months postoperatively. Absent patients were called by phone. Ultrasonography (USG) was performed in patients with swelling at the surgical site. Patients with facial defects were considered as recurrence. The groups were compared in terms of BMI, ASA, mesh diameter, operation time, hospitalization time, VAS, recurrence, and complications.

Surgery techniques

Open surgery: Abdominal on-lay mesh technique was applied. Fascia was dissected up to 4-5 cm from the edges of the defect. In patients with primary closure of the fascia defect, polypropylene was approximated continuously with number one sutures. In all cases with primary closure, an on-lay polypropylene mesh was placed on the abdominal fascia without tension. The mesh was individually secured with 3-0 or 2-0 polypropylene sutures.

Laparoscopic surgery: Intraperitoneal mesh technique was applied. Spiral Tacker (Origin Medical Systems, Menlo Park, California) and transfixion suture materials were used for intraperitoneal fixation of the mesh. Suture Passer (W.L.Gore, Flagstaff, AZ) and 2 number 16 intravenous cannulas (Gntrakit®, Medikit®) were used to remove the prolene thread ends from the abdominal wall. The prepared mesh was sutured with polypropylene thread at four corners and tied with two 10 cm long ends. Additional holes were created in the mesh to reduce seroma formation. The corners of the mesh and the corresponding skin were marked with the same type of markings. After the mesh was pushed into the abdomen through a 10 m trocar, it was opened according to the markings. 1-2 m incisions were made on the skin at the marked places. With a suture passer or intravenous cannula inserted into the abdomen from here, the sutures on the edges of the mesh were taken out of the abdomen, passing through the fascia at separate points. The suture knots tied outside were pushed under the skin. The edges of the mesh were fixed to the abdominal wall with spiral titanium staples in single (Figure 1A) and double rows approximately 1 cm apart (Figure 1B). A polydioxanone (PDS) suture was placed in the 10-mm trocar hole with a suture passer and this suture was tied after the intra-abdominal CO2 was drained.

Statistical evaluation

Student-T test was used for comparisons with $p>0.05$ in Levene's test (age, BMI, mesh diameter, length of hospitalization, duration of operation); non-parametric Mann-Whitney U test was used for comparisons with $p<0.05$ in Levene's test (duration of operation, ASA values, VAS values) Chi-square test was used to compare the complications of the two groups and Fisher's exact probability test was used to compare the

recurrence rates. All tests were two-sided and p<0.05 values were considered significant.

Ethical approval

This study was approved by the Ethics Committee of Okmeydanı Training and Research Hospital (Date: 2020-07-13, No: 48670771- 903.99).

Results

In Group 1, the hernia was located at the umbilical/para/epigastric incision line in 17 cases, midline in 8 cases and peripheral incision line in 5 cases. In Group 2, the hernia was located at the umbilical/para/epigastric incision line in 4 cases, midline in 22 cases and peripheral incision line in 4 cases. Fifteen (25%) patients were female and 45 (75%) were male. The mean age was 54.7 (37-73) in Group 1 and 59.5 (34-75) in Group 2 (p=0.07). There was no statistically significant difference in BMI and ASA between both groups (p=0.87, P=0.74). The mean mesh diameter was 276.0 (150-900) cm^2 in Group 1 and 297.5 (100-900) cm^2 in Group 2, and this difference was not statistically significant (p=0.655). The mean operative time was 80.0 (60-150) minutes in Group 1 and 72.5 (45-160) minutes in Group 2 (p=0.07). The mean hospital stay was 2.3 days (1-9) in Group 1 and 3.5 days (1-20) in Group 2 (p=0.089). The mean VAS value at 72 hours was 2.56 in Group 1 and 4.43 in Group 2 and the difference between these values was statistically significant (p=0.000) (Table 1). A total of 26 complications were observed in both patient groups. Prolonged ileus was observed in a total of 3 patients, 2 in Group 1 and 1 in Group 2. In all 3 cases, improvement was achieved with conservative treatment and these cases were not considered as real morbidity and were not included in the statistical study. The complications observed in both groups are shown in Table 2. Wound infection was observed in 1 case in Group 1 and in 3 cases in Group 2. Intestinal injury occurred in 1 patient in Group 1. The patient was re-operated on post-op day 4. This small area of injury was approximated as a stoma. Due to intra-abdominal infection, the mesh was removed and the abdomen was left open for 9 days. However, the patient died on the 9th postoperative day due to septic shock. Complications were found in 11 (36.6%) patients in Group 1 and 12 (40%) patients in Group 2. There was no statistically significant difference between the two groups in terms of the number of cases with complications (p=0.567). Recurrence was detected in one (3.3%) case in Group 1 and 4 (13.3%) cases in Group 2 (p=0.35). The mean follow-up period was 18 (6-34) months in Group 1 and 21 (5-28) months in Group 2.

Table 1. Comparison of age, BMI, operation time, mesh diameter, ASA, VAS and hospital stay

	Group 1	Group 2	P
Age	54.7 (37-73)	59.5 (34-75)	0.076
BMI (kg/m2)	30.8	30.7	0.873
Operation time (dk)	80 (60-150)	72.5 (45-160)	0.073
Mesh diameter (cm2)	276 (150-900)	297.5 (100-900)	0.655
ASA	2 (1-2)	2 (1-3)	0.741
VAS			
24.hour	5.66(4-7)	5.76 (4-7)	0.658
48.hour	4.3 (3-5)	4.66 (4-7)	0.065
72.hour	2.56 (1-4)	4.43 (3-5)	0.000 #
Length of hospital stay (days)	2.3 (1-9)	3.5 (1-20)	0.089

BMI: Body Mass Index, ASA: Anesthesia Score Values, VAS: Visual Analog Scale, #: p<0.05

Table 2. Complications

Komplikasyonlar	Group 1 (n %)	Group 2 (n %)	p
Wound infection	1 (3.3)	3 (10)	
Hematoma	1 (3.3)	_	
Seroma	4 (13.3)	1 (3.3)	
Infected mesh	_	1 (3.3)	
Mesh extraction	_	1 (3.3)	
Intestinal injury	1 (3.3)	_	
Pulmonary Complication	1 (3.3)	_	
Genitourinary Complications	1 (3.3)	1 (3.3)	
Deep vein thrombosis	_	1 (3.3)	
Recurrence	1 (3.3)	4 (13.3)	0.353 *
Mortality	1 (3.3)	_	

n= number of complications, *= p>0..05

Discussion

In our study, the mean BMI was 30.8 kg/m2 in LVHO patients, while the mean BMI was 30.7 kg/m2 in AVHO patients. There was no statistically significant difference between the two groups in terms of BMI and ASA values. Similarly, Olmi et al. found no difference in BMI and ASA values [7]. The mean BMI of our patients in both groups was >30 kg/m2. This shows that most of our patients were obese. Complications were found in 33.3% and recurrence in 3.3% of the patients who underwent LVHO. In general, obese patients (BMI ≥30 kg/m2) are considered poor surgical candidates for ventral hernia repair due to associated co-morbidities, postoperative wound infection and risk of hernia recurrence. Many studies have reported that LVHO can be safely performed in obese patients with ventral-incisional hernia and has low complication rates [10,11]. Moreover, even in patients with morbid obesity, laparoscopic repair of ventral hernias can be performed with minimal morbidity and without recurrence [12]. However, no consensus has yet been reached on this issue. The data we obtained in this study seem to support the feasibility of LVHO in obese patients with ventral-incisional hernia.

Pain is common after vental-incisional hernia repair. There may be early post-operative pain as well as long term persistent pain. Patients may have pain or point tenderness at the transabdominal fixation points after LVHO. In the study by Park et al. [13], prolonged suture site pain after LVHO was reported to be 3.5%, while it was 4% in open repair. In contrast, in the study by Chari et al. [14], persistent suture site pain was not reported in any of the patients. Similar to the results of Chari et al. study, no patient in our study had persistent suture pain. Although there are studies [6, 15, 16] suggesting that LVHO reduces early post-operative pain, studies that do not support this view have also been published [17, 18]. In a study by Parkash et al. [6], patients who underwent LVHO and AVHO were compared in terms of VAS at post-operative 24th, 48th and 72nd hours and VAS values were found to be lower in

patients who underwent LVHO. Similarly, in our study, VAS at 72 hours was compared in both groups and was found to be lower in patients who underwent LVHO. These data support the view that LVHO reduces pain in the early post-operative period. In our study, mesh diameters in patients who underwent LVHO were lower than those who underwent open surgery, although not statistically significant. Therefore, we believe that mesh size and the number of laparoscopic staples applied may be effective in the occurrence of post-operative pain.

Many studies have been published showing that the length of hospital stay is shorter in LVHO compared to AVHO [7, 18]. However, there are also studies showing that there is no significant difference between both methods [19, 20]. The duration of hospitalization in patients undergoing LVHO is 1.5-3 days. In our study, the duration of hospitalization in terms of LVHO was consistent with the literature. The mean hospital stay was 2.3 days in patients who underwent LVHO and 3.5 days in patients who underwent AVHO. Although this difference was not statistically significant, there was one day less hospital stay in favor of LVHO and we think that this should be taken into consideration.

There are publications reporting a shorter operation time in patients undergoing LVHO [15, 16, 18], as well as publications reporting no difference between both methods or a longer operation time in patients undergoing LVHO [21, 22]. The data obtained in our study were consistent with the relevant literature and no difference was found between the two groups in terms of operative time. However, the operation time was slightly longer in the LVHO Group. We believe that the presence of adhesions on the abdominal wall in some cases, the prolonged duration of the operations performed while the surgical team was completing the learning curve, and the time it took to place and fix the mesh on the ventral abdominal wall may be effective in this prolongation.

Many studies have reported that LVHO reduces post-operative complications [19, 21]. However, studies showing that there is no difference between LVHO and AVHO have also been published [8]. In our study, complications were found in 33.3% in the LVHO Group and 23.3% in the AVHO Group. There was no significant difference between both groups. In previous studies, bowel injury as a major complication was reported as 1.7-3% [22, 23]. Mortality developed in one (3.3%) of our patients due to septic shock after intestinal injury. Although our data support the view that LVHO reduces post-operative complications, the surgeon should keep in mind that major complications may develop during laparoscopic repair. In this overlooked case, enterotomy was probably due to intraoperative electro cautery burn. To avoid this, we think that sharp dissection using bipolar cautery, scissors and forceps would be more beneficial.

In many studies, no difference was found between LVHO and AVHO in terms of recurrence [8, 24]. On the other hand, some studies reported low recurrence rates (0-9%) in favor of LVHO [8, 11, 12]. The recurrence rate was 3.3% in the LVHO Group and 13.3% in the AVHO Group. The follow-up period was 18 months in the LVHO Group and 21 months in the AVHO group. In our study, there was no difference between the groups in terms of recurrence. Our study data support the view that there is no difference between LVHO and AVHO in terms of recurrence. Between 66% and 90% of recurrences occur within the first two years [24, 25]. Therefore, we think that our follow-up period is sufficient to evaluate recurrence cases.

The most important limitation of our study is the small number of patients. The fact that the results of our study may change with revisions to be made with the change in medical technologies is another limitation.

Conclusıon

LVHO seems to be as effective and safe as open surgery in patients with ventral-incisional hernia. Postoperative pain may develop less in patients undergoing LVHO compared to open surgery. However, prospective studies involving large patient groups are needed to standardize this method.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or compareable ethical standards.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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